RENISHAW®
apply innovation™

Part alignment - plane, line and point (non-CAD)

+ Direction
Primary / first axis
Created from a plane

+Z

+ Direction
Second axis
Created from a line

+Y

Tertiary axis
Created from a point

+X

RENISHAW®
apply innovation™

MODUS

Renishaw part no: H-1000-5311-01-A

Issued: 12 2013

Part alignment - plane, line and point (non-CAD)

Care of equipment

Renishaw probes and associated systems are precision tools used for obtaining precise measurements and must therefore be treated with care.

Changes to Renishaw products

Renishaw reserves the right to improve, change or modify its hardware or software without incurring any obligations to make changes to Renishaw equipment previously sold.

Warranty

Renishaw plc warrants its equipment for a limited period (as set out in our Standard Terms and Conditions of Sale) provided that it is installed exactly as defined in associated Renishaw documentation.

Prior consent must be obtained from Renishaw if non-Renishaw equipment (e.g. interfaces and/or cabling) is to be used or substituted. Failure to comply with this will invalidate the Renishaw warranty.

Claims under warranty must be made from authorised service centres only, which may be advised by the supplier or distributor.

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Contents

1   Part alignment - plane, line and point (non-CAD)

1.1   Tutorial pre-requisites

- The student should be familiar with the 'Principles of part alignment'

1.2   Tutorial objectives

- Introduction to the fundamentals of creating a MODUS inspection program

- Concepts and definitions of nominal and actual features

- Familiarisation with text (DMIS) based programming

- Introduction of basic alignment operations

2   Introduction

This tutorial introduces the student to manual measurement of features on the Renishaw training block and basic concepts of prismatic part alignment.

3   Create a new program

Click: 'File'.

Select: 'New Program'.

Click: 'Browse'.

Check the 'Open Inspection' dialog.
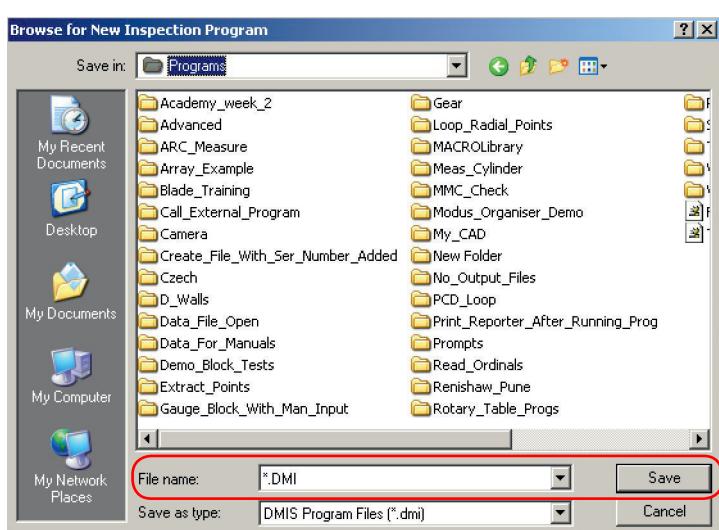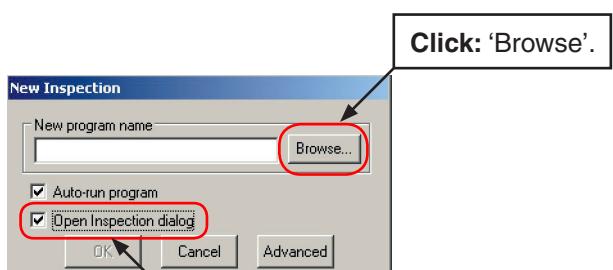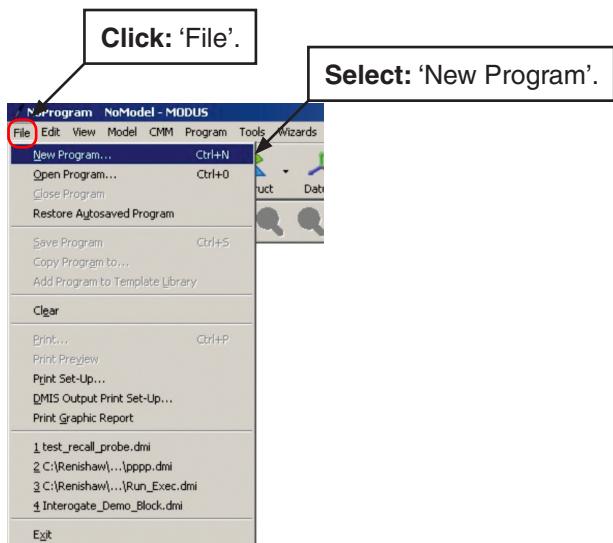
Enter the new program name in 'File Name'.

Click: 'Save' to continue.

New Inspection

New program name
C:\Renishaw\Programs\test.DMI   Browse...

☑ Auto-run program
☑ Open Inspection dialog
    OK   Cancel   Advanced

Click: 'OK'.

New Inspection

Scan | Scripting | SPC Transfer | Offline
Results Files | Comparator Settings
Program | Model | Reporting | External Paths | Repeat Options

File details

	File	Path	File name
	Input File	C:\Renishaw\Pro...	test.DMI
☑	Output File	C:\Renishaw\Pro...	test.out
☑	VFORM Report F...	C:\Renishaw\Pro...	test.res
☐	XML Output	C:\Renishaw\Pro...	test.xml
☐		C:\Renishaw\Pro...	test.dta

Append to filenames
☐ Date and time
☐ Text

Mode
⦿ Inspect   ○ Report

CMM operation (1)
⦿ Online operation
○ Offline operation
☐ Close windows

CMM operation (2)
○ Manual operation
○ Automatic operation

Inspection
⦿ Start new   ○ Continue previous

    OK   Cancel   Apply   Help

Check: 'Online Operation'.

The following header will be inserted into the program:

```
000001   DMISMN/'Start Template',05.2
000002   FILNAM/'Start Template',05.2
000003   DV(0)=DMESWV/'13,1,2,212'
000004   UNITS/MM,ANGDEC
000005   DECPL/ALL,DEFALT
000006   V(0)=VFORM/ALL,PLOT
000007   DISPLY/TERM,V(0),STOR,DMIS,V(0)
000008   SNSET/APPRCH,5
000009   SNSET/CLRSRF,15
000010   SNSET/DEPTH,0
000011   D(0)=DATSET/MCS
000012   MODE/MAN
000013   T(CORTOL_X1)=TOL/CORTOL,XAXIS,-0.1,0.1
000014   T(CORTOL_Y1)=TOL/CORTOL,YAXIS,-0.1,0.1
000015   T(CORTOL_Z1)=TOL/CORTOL,ZAXIS,-0.1,0.1
000016   T(DIAM_1)=TOL/DIAM,-0.1,0.1
000017  ▶PAUSE
000018   ENDFIL
```

Info: This header can be edited to suit specific requirements.

it can be found in:-

C:\Program Files\Renishaw\Modus\n,n\Template.dmi

Next insert some line spaces to make the program easier to read. Press:

ctrl   I

Insert Command

OK   Cancel

Put a space in the window.

Click: 'OK' to close and insert the line.

```
000003   DU(0)=DMESWU/'13,1,2,212'
000004   UNITS/MM,ANGDEC
000005   DECPL/ALL,DEFALT
000006   U(0)=VFORM/ALL,PLOT
000007   DISPLY/TERM,U(0),STOR,DMIS,U(0)
000008   SNSET/APPRCH,5
000009   SNSET/CLRSRF,15
000010   SNSET/DEPTH,0
000011   D(0)=DATSET/MCS
000012   MODE/MAN
000013   T(CORTOL_X1)=TOL/CORTOL,XAXIS,-0.1,0.1
000014   T(CORTOL_Y1)=TOL/CORTOL,YAXIS,-0.1,0.1
000015   T(CORTOL_Z1)=TOL/CORTOL,ZAXIS,-0.1,0.1
000016   T(DIAM_1)=TOL/DIAM,-0.1,0.1
000017
000018
000019
000020
000021
000022   PAUSE
000023   ENDFIL
```

Place the cursor on line 000018.

Recall the sensor:

Click: 'Sensor'.

Help

Sensor   Settings   Move

Select
Recall
Requalify
Update Geometry
Set Tool
Output Sensor

Select: 'Recall'.

Select the required sensor from the drop down menu:

Recall Sensor

Recalled sensors

Label   PH10_PAA1_TP200_D3x20.1.20.2.A0.0-B0.0

Delete

Delete all

Probe model

Probe model file

Create probe model

Create star probe model

OK   Cancel

Click: 'OK' to continue.

Select the sensor:

Click: 'Sensor'.

Select: 'Select'.

Select the required sensor from the drop down menu:

Click: 'OK' to continue.

```
000012   MODE/MAN
000013   T(CORTOL_X1)=TOL/CORTOL,XAXIS,-0.1,0.1
000014   T(CORTOL_Y1)=TOL/CORTOL,YAXIS,-0.1,0.1
000015   T(CORTOL_Z1)=TOL/CORTOL,ZAXIS,-0.1,0.1
000016   T(DIAM_1)=TOL/DIAM,-0.1,0.1
000017
000018   RECALL/SA(PH10_PAA1_TP200_D3x20.1.20.2.A0.0-B0.0)
000019   SNSLCT/SA(PH10_PAA1_TP200_D3x20.1.20.2.A0.0-B0.0)
000020
000021
000022
000023   PAUSE
000024   ENDFIL
```

The program will now have two additional lines which recalls and selects the sensor.

4   Measure a plane, line and point

Click: 'Inspect'.
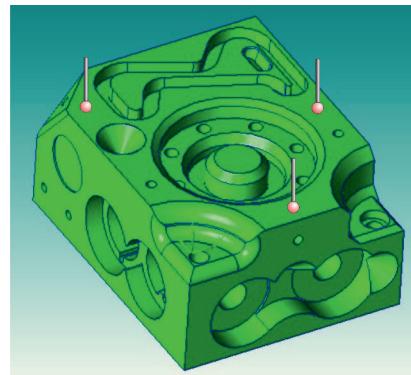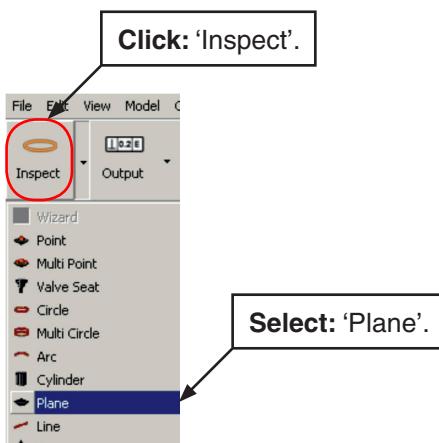
Select: 'Plane'.

Take a minimum of 3 points on the plane:

Click: 'Apply' to complete the measuring cycle.
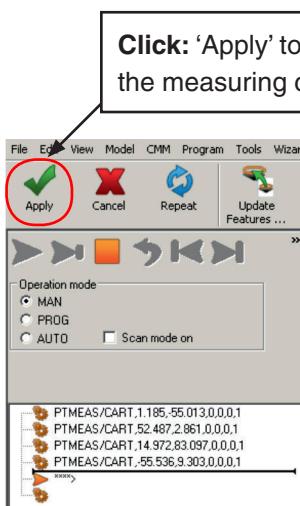
To create a primary axis on this feature click 'Datum' then select 'One Axis':

Click: 'Datum'.

Select: 'One Axis'.

Give the new datum a label.

Measured feature.

**Click:** 'Inspect'.

Select: 'Line'.
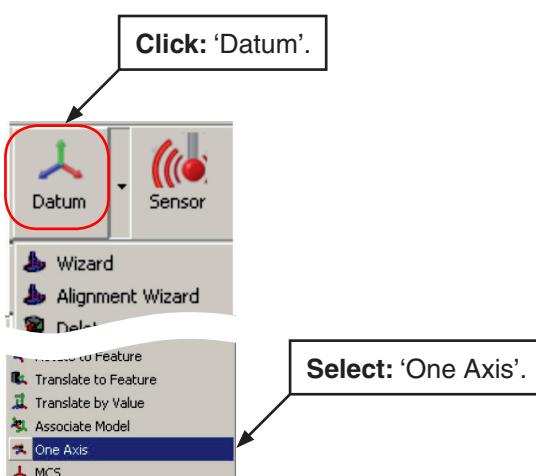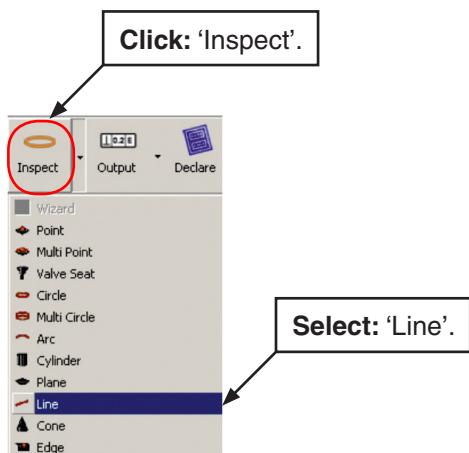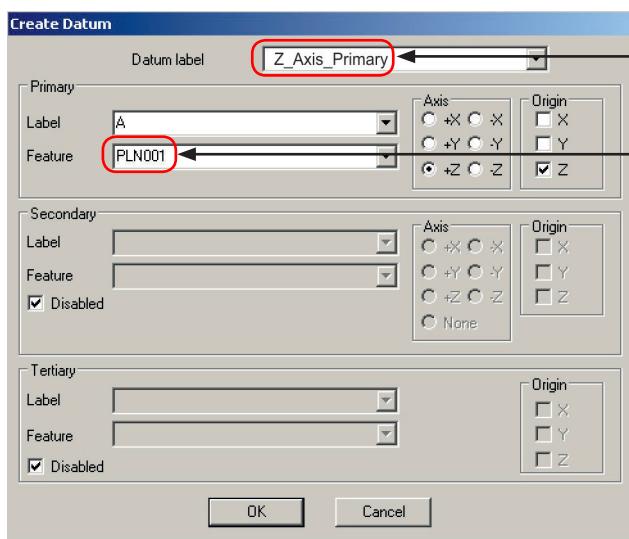
Take a minimum of 2 points on the line:
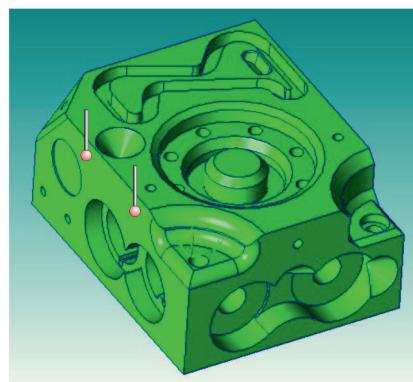
It is very important to take note of the direction when taking the points ie. front to back, back to front, left to right, right to left, + to - and - to +. This has a direct effect on the vector of the measured line and subsequent orientation of the part. If the next part is measured in the opposite direction then the part coordinate system would be rotated 180 degrees away from the original.

Click: 'Apply' to complete the measuring cycle.
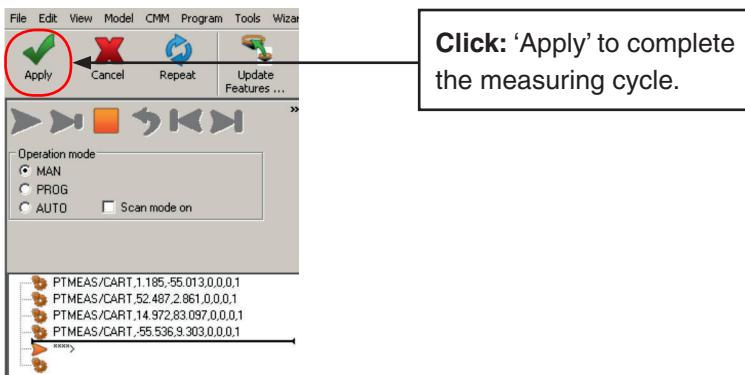
To create a secondary axis on this feature click on 'Datum' then select 'Two Axes':

Click: 'Datum'.

Select: 'Two Axes'.

Give the new datum a label.

Measured feature.

Set the Y direction with an origin on X.

Click: 'Inspect'.

Select: 'Point'.

Take 1 point on the side:

Click: 'Apply' to complete the measuring cycle.
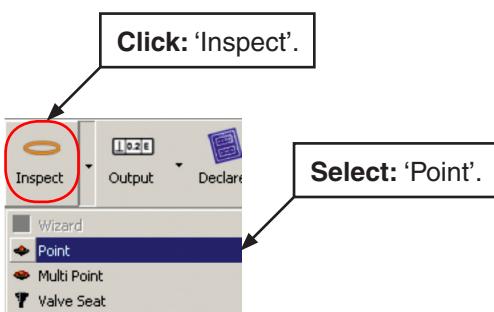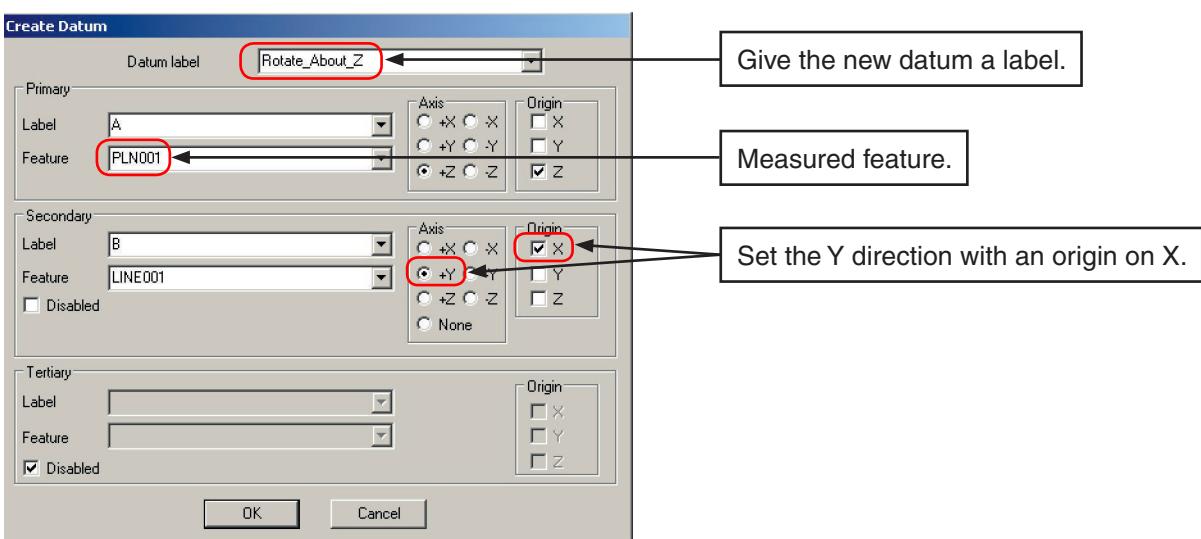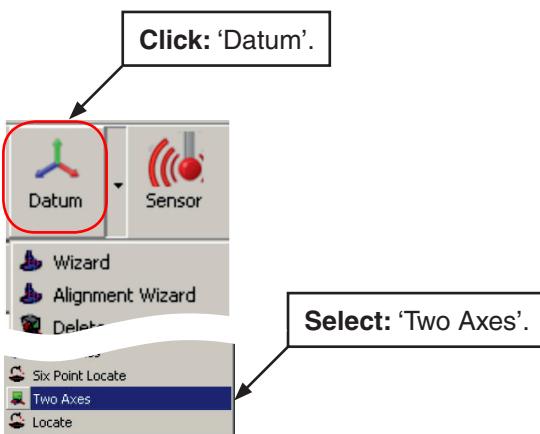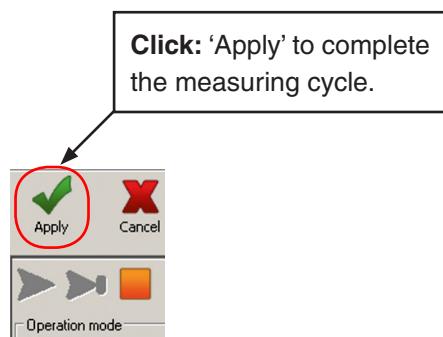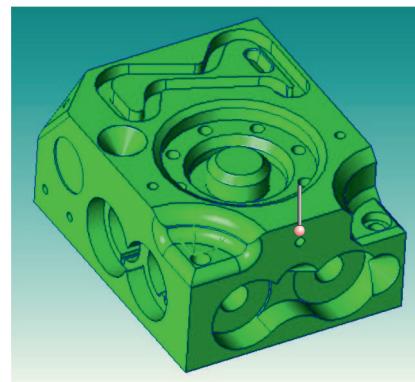
To complete the alignment using the features measured click 'Datum' then select 'Three Axes':

Click: 'Datum'.

Wizard
Alignment Wizard
Delete
Set Model
Equate
Six Point Locate
Three Axes

Select: 'Three Axes'.

+Z
Top face: PLN001

+Y
Side face:
LINE001

+X
End face
point: PNT001

Assign a label

In this case PLN001 is
the PRIMARY AXIS [+Z]

LINE001 is the SECONDARY AXIS [-Y]
with datum / origin on X

PNT001 is the
TERTIARY DATUM [Y]

Click: 'OK' to complete the procedure.
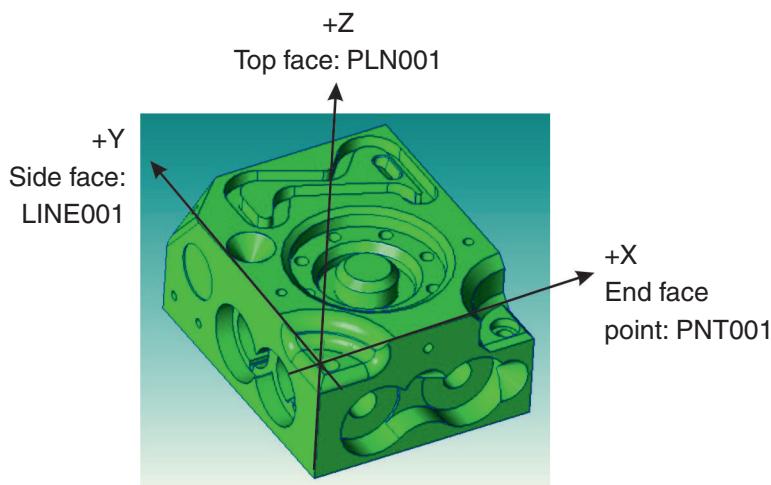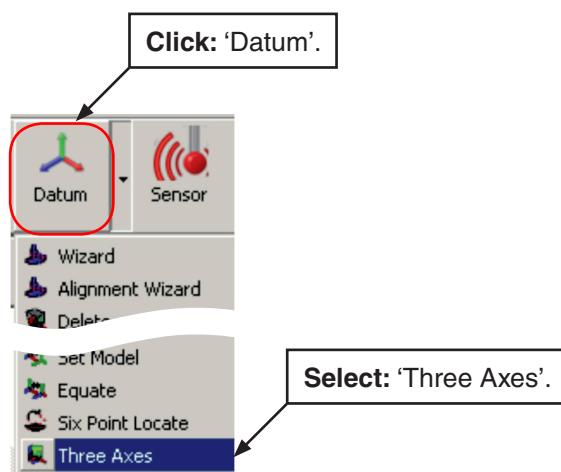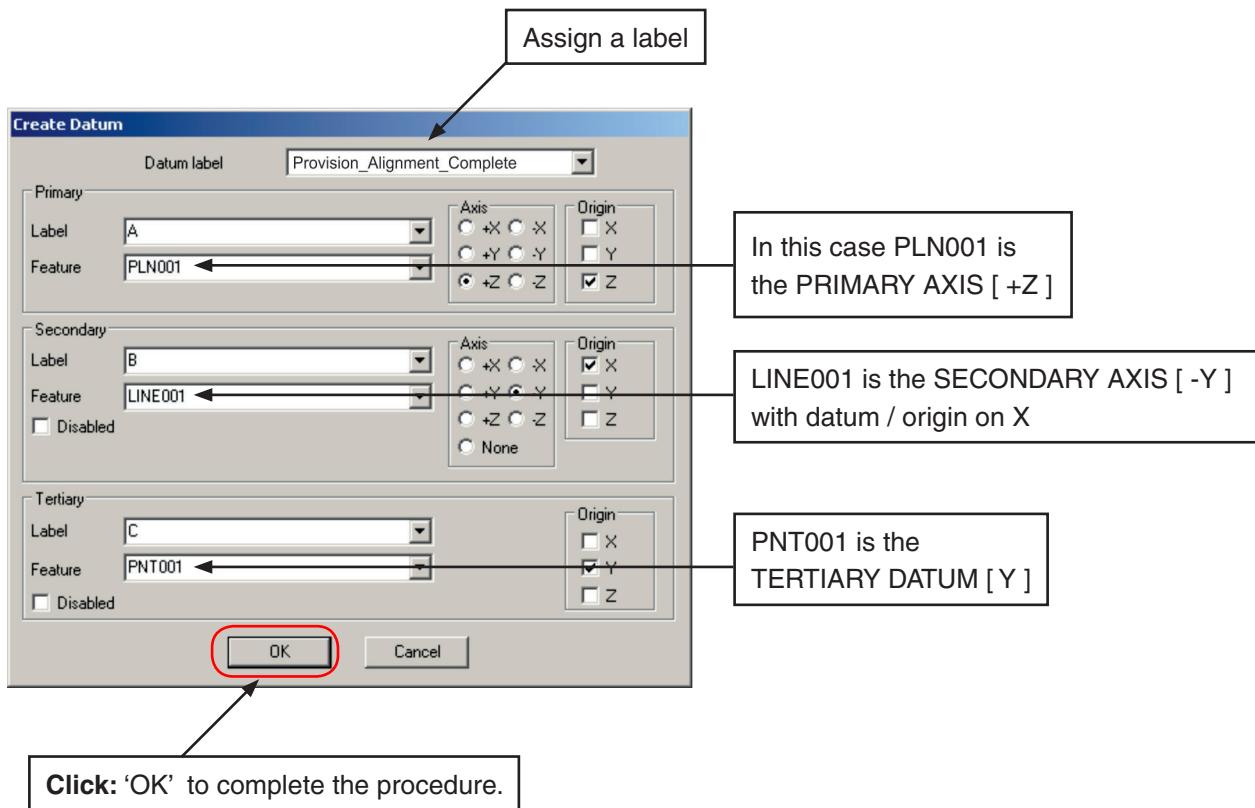
Finally click on 'Datum' then select 'Save' to complete the alignment process.

THE PART ALIGNMENT IS NOW COMPLETE AND IS READY FOR MEASUREMENT.

NOTE: This is a very basic manual alignment using minimum points and is not accurate enough for good metrology.

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